

CLAIMS

What is claimed is:

1. A radio frequency/microwave junction-type
5 circulator, comprising:

a plurality of signal ports;

a plurality of junctions connected in cascade and
configured to provide a plurality of transmission paths
between the signal ports, each junction including a
10 conductor element patterned to correspond to at least a
portion of the plurality of transmission paths;

a ferrite component configured to overlay the
plurality of junctions; and

a permanent magnet arranged in relation to the
15 ferrite component so as to generate a magnetic field in
the ferrite component, thereby causing non-reciprocal
operation of the plurality of transmission paths between
the signal ports.

20 2. The circulator of claim 1 wherein the ferrite
component comprises two ferrite elements and the
conductor elements are sandwiched between the two ferrite
elements.

25 3. The circulator of claim 1 wherein the conductor
elements comprise corresponding portions of a single
conductor component.

4. The circulator of claim 1 wherein the plurality of junctions, the ferrite component, and the permanent magnet are disposed in a metal housing.

5. The circulator of claim 4 wherein the metal housing includes a cover and a base portion and the circulator further comprises a first pole piece disposed between the permanent magnet and the ferrite component, a second pole piece disposed between the base portion of the housing and the conductor elements, and a cover return component disposed between the housing cover and the permanent magnet.

6. The circulator of claim 5 wherein the first and second pole pieces, the permanent magnet, the metal housing, and the cover return component are arranged in relation to each other so as to form a magnetic circuit for generating the magnetic field in the ferrite component.

7. The circulator of claim 2 further including a dielectric constant medium disposed between the ferrite elements and a ground plane disposed between the ferrite component and the permanent magnet.

8. The circulator of claim 7 wherein the ferrite elements, the dielectric constant medium, the conductor elements, and the ground plane are arranged in relation to each other so as to form a radio frequency/microwave

circuit for causing the non-reciprocal operation of the transmission paths when the magnetic field is generated in the ferrite component.

5 9. A method of manufacturing a radio
frequency/microwave junction-type circulator, comprising
the steps of:

10 providing a plurality of junctions connected in
cascade and configured to form a plurality of
transmission paths between a plurality of signal ports,
each junction including a conductor element patterned to
correspond to at least a portion of the plurality of
transmission paths;

15 providing a ferrite component configured to overlay
the plurality of junctions; and

20 providing a permanent magnet arranged in relation to
the ferrite component so as to generate a magnetic field
in the ferrite component, thereby causing non-reciprocal
operation of the transmission paths between the plurality
of signal ports.

25 10. The method of claim 9 further including the step of
disposing the plurality of junctions, the ferrite
component, and the permanent magnet in a metal housing.

11. The method of claim 10 further including the steps
of providing a first pole piece disposed between the
permanent magnet and the ferrite component, providing a
second pole piece disposed between a base portion of the

metal housing and the conductor elements, and providing a cover return component disposed between a cover of the metal housing and the permanent magnet.

- 5 12. The method of claim 9 further including the steps of providing a dielectric constant medium between first and second ferrite elements of the ferrite component, and providing a ground plane disposed between the ferrite component and the permanent magnet.